Large-Scale Demonstration & Deployment D&D

Los Alamos
NATIONAL LABORATORY
Environmental Science and Waste Technology

TECHNICAL DEMONSTRATION SUMMARY SHEET; Race Scan Ear Mic System for Communication in D&D Environments

Figures 1 and 2 Images of Phase I and Phase II of the Race Scan Ear Mic System demonstration

SUMMARY: The Integrating Contractor Team of the Los Alamos National Laboratory (LANL) Large Scale Demonstration and Deployment Project (LSDDP) demonstrated the Race Scan Ear Mic System to allow vocal communication between workers inside confined zones where loud equipment is used, and with people outside the work zone. Presently, LANL workers communicate with workers inside and outside the work zone through hand signals, and shouting through respirators.

The results of this demonstration concluded that the Race Scan Ear Mic System will effectively enhance communication in D&D operations. Task efficiency and accuracy will improve since workers are capable of more complete and effective communication between each other and supervising personnel. Safety will be improved since workers can speak to each other around moving equipment and emergency communication with safety personnel outside the work zone is possible.

THE NEED: In a Decontamination and Decommissioning (D&D) environment, heavy equipment such as forklifts, cranes, and various other machines produce noise at levels that limit workers ability to communicate with each other while in the work zone. Furthermore, the confines of the work zone, such as walls and distance, prevent workers from communicating with people outside of the work zone. Effective communication is vital for safety, to maximize task efficiency, to reduce worker frustration and to aid in data recording. Also, additional program costs for exit, regroup and reentry will be incurred if communication limits data transfer between workers inside the work zone with supervision on the outside.

THE TECHNOLOGY: The Race Scan Ear Mic System was developed by Race Scan Communications and is marketed exclusively by Radiation Protection Systems (RPS). The system was originally developed for use in the NASCAR racing industry for communication between drivers within the loud environment of a racing car and a pit crew. The system is applicable to D&D work since the noise produced by machines in the work area may reach as high as the inside of a racing car, and workers must communicate with outside supervision without interference of back ground noise. Figure 3 shows the Ear Mic System components. The system includes two earpieces, a push to talk switch, and associated wiring. The system currently works with some Ericson and most Motorola two-way radios. Separate earpieces are designed for the right and left ears. The right earpiece contains a speaker, and the left contains a microphone. The ear microphone works by receiving voice sonics inside the ear canal. Race Scan Communications offers standard or custom molded earpieces. The standard earpieces are offered in small medium and large. The custom earpieces provide noise reduction to 40 dBA while allowing clear communication without interference of background noise. Somewhat less noise reduction may be expected using the standard earpieces since they will not fit perfectly within the ear. The custom molded earpieces are recommended by the manufacturer to maximize noise reduction, and to insure that they remain in place.

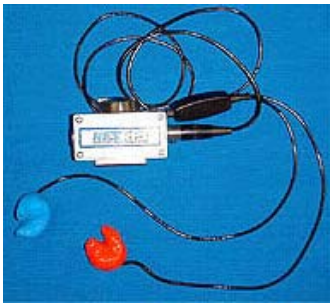

Figure 3 - Race Scan Ear Mic System Components

All Ear Mic System equipment is worn under PPE, minimizing worker interference and preventing equipment contamination.

THE DEMONSTRATION: In this demonstration, the Ear Mic System was used in place of the typical means of communication for two ongoing Decontamination and Decommissioning (D&D) operations at LANL. The first phase was a waste drum retrieval from an above ground berm, and the second was a waste box sampling operation carried out within a PermaCon structure.

The waste box sampling operation is a fairly new operation at LANL, and contact between the workers and supervisors outside the PermaCon is critical for worker training, and for data exchange purposes. Communication is limited by the noise produced by a ventilation fan and power tools used in the area, and the walls of the PermaCon structure. The typical means of communication is shouting through the windows of the PermaCon, hand signals or writing on signs.

In the waste drum retrieval operation, communication is limited by the noise produced by a crane. This operation has been ongoing for approximately one year, and workers have become efficient at performing their tasks using only hand signals. At this site, it is possible for the workers to communicate with a supervisor by walking to the edge of the work zone. The workers can communicate with each other within the work zone by gathering away from the crane.

For each phase of the demonstration, the workers were asked to perform their normal work activities using the Race Scan Ear Mic system in place of the baseline technology. The baseline technology for this demonstration was communication such as hand signals and shouting. Each worker was dressed in PPE consisting of coveralls and a full-face respirator, with the Race Scan Ear Mic system equipment worn under each worker's PPE. For this demonstration, standard Race Scan earpieces were used instead of custom fitted pieces. The workers were asked to evaluate the system with respect to:

- Comfort
- Clarity
- Ease of use
- Safety
- Improved task efficiency
- Interest in continued use
- Noise reduction

THE RESULTS: In both phases of the demonstration, all workers were impressed with the transmission clarity, ease of use and comfort of the Ear Mic System and look forward to using it in the future. All felt the quality of communication between all workers in each phase of the demonstration was superior to that of the baseline technology. All workers thought safety will be enhanced by use of the system since direct communication with medical, or safety services is possible.

Most workers felt that the standard sized earpieces were somewhat comfortable, although a few had problems getting the earpieces in correctly. All workers thought the earpieces provide adequate noise reduction, while allowing clear transmission with very little background noise interference. All workers felt the Ear Mic System was very simple to operate within PPE. Most workers were satisfied with the performance of the system, although some thought the performance would be improved by using custom ear molds for added comfort, better noise reduction, and to better secure the earpieces within the ear.

In both phases of the demonstration, it was noted that operations went much smoother in that much less effort and time was expended by workers attempting to communicate with each other and supervision on the outside. In both phases of the demonstration it was possible for workers to speak to each other and to supervision outside the work zone without each worker having to move from their workstation. There was no limitation on transmission clarity noted due to the walls of the PermaCon for waste box sampling phase of the demonstration.

BENEFITS:

- Clear transmission through walls of confinement zone and between workers while working in loud environments
- Simplifies operations and increases safety through enhanced communication
- Reduces unnecessary exit and reentry due to poor communication between workers inside and outside the work zone
- Noise exposure reduction by 40 dBA
- Comfortably worn under PPE.

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